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Wu et al.

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(54) **TILT-OUT ICE BIN FOR REFRIGERATOR**

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patent is extended or adjusted under 35
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(21) Appl. No.: **12/272,835**

(57) **ABSTRACT**

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(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 11/283,970, filed on
Nov. 21, 2005, now Pat. No. 7,469,553.

A refrigerator having an insulated cabinet and a door pivotally
mounted to the cabinet having an exterior face including a
dispenser cavity. An ice maker in the refrigerated storage
space is arranged to make and harvest ice pieces. An ice
delivery system on the inside of the door dispenses ice pieces
into a dispenser cavity in the exterior face of the door. The ice
delivery system can include an ice bin including a generally
open top and having a bottom opening pivotally mounted on
a horizontal axis below the ice maker. The ice can receive ice
pieces harvested by the ice maker and discharge ice pieces
through the bottom opening and the ice delivery system in a
first position. The ice bin can tilt out to permit access to ice
pieces, and can be removed from the ice delivery system, in a
second position when the door is open.

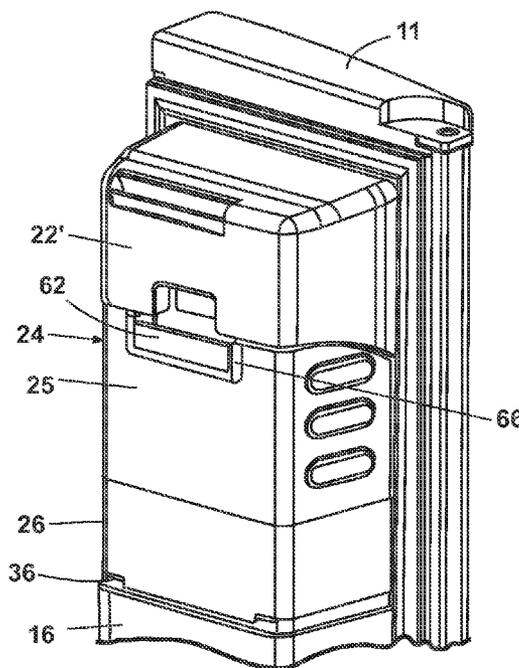
(51) **Int. Cl.**
F25C 5/18 (2006.01)

(52) **U.S. Cl.** **62/344**; 62/353; 312/405

(58) **Field of Classification Search** 62/344,
62/353; 312/401–406

See application file for complete search history.

20 Claims, 8 Drawing Sheets



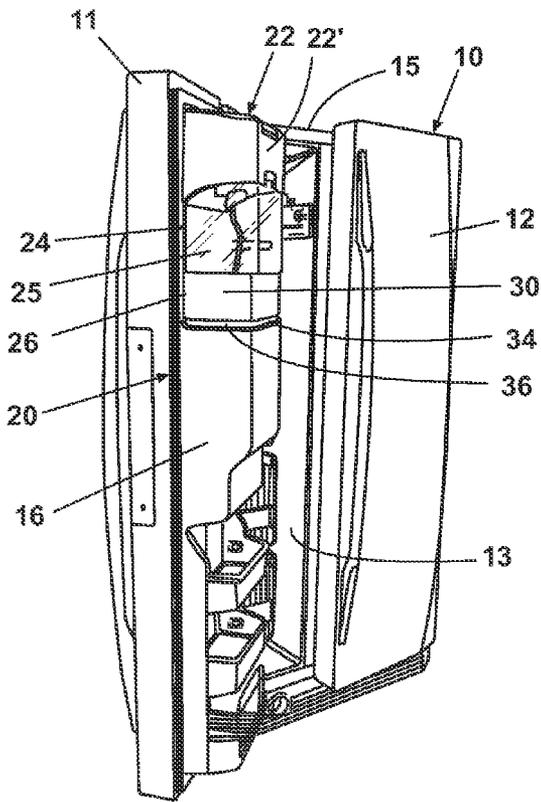


Fig. 1

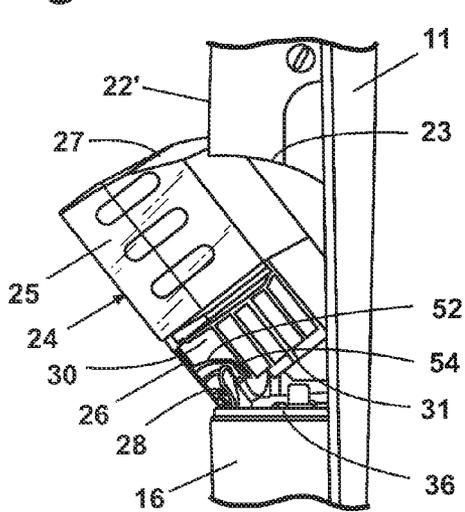


Fig. 2

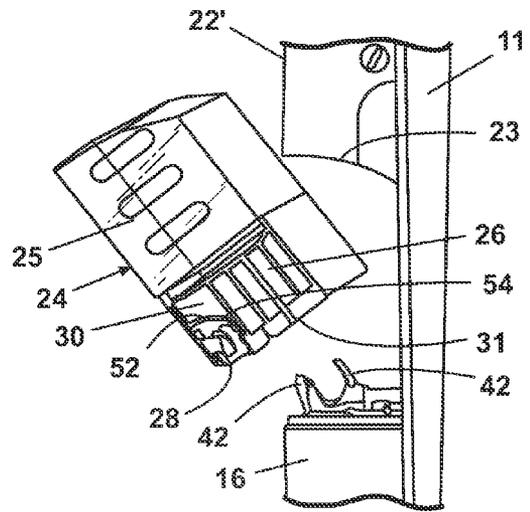


Fig. 2A

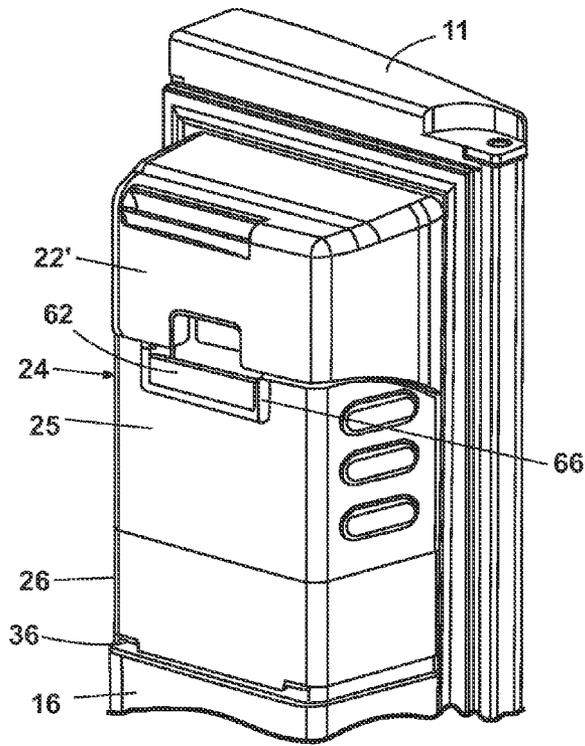


Fig. 3

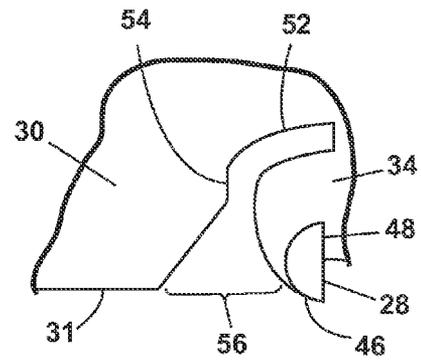


Fig. 4

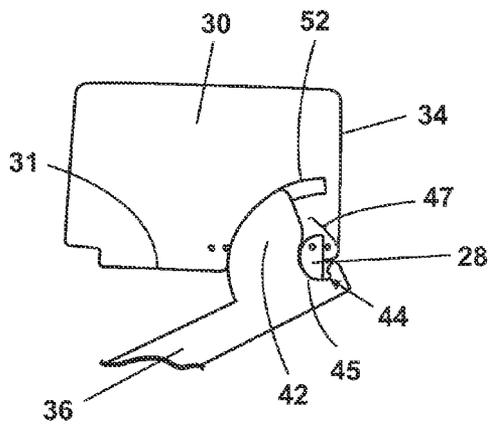


Fig. 5

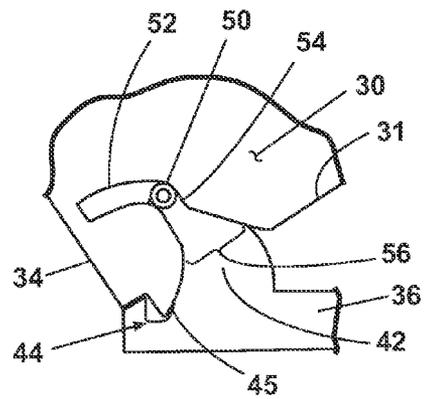


Fig. 5A

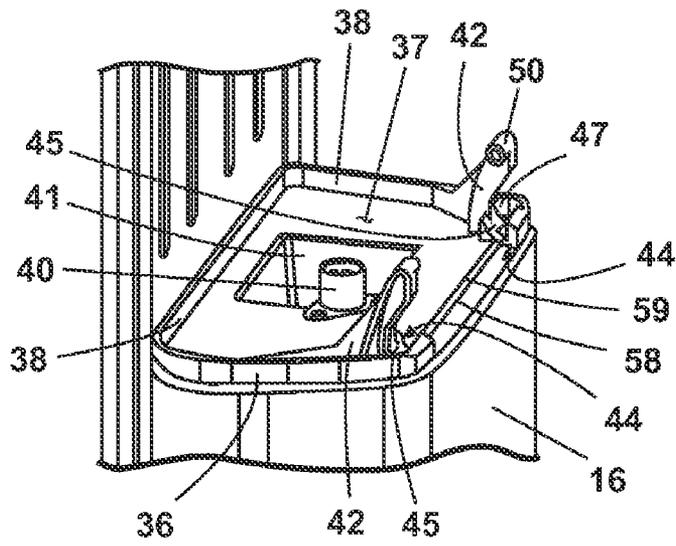


Fig. 6

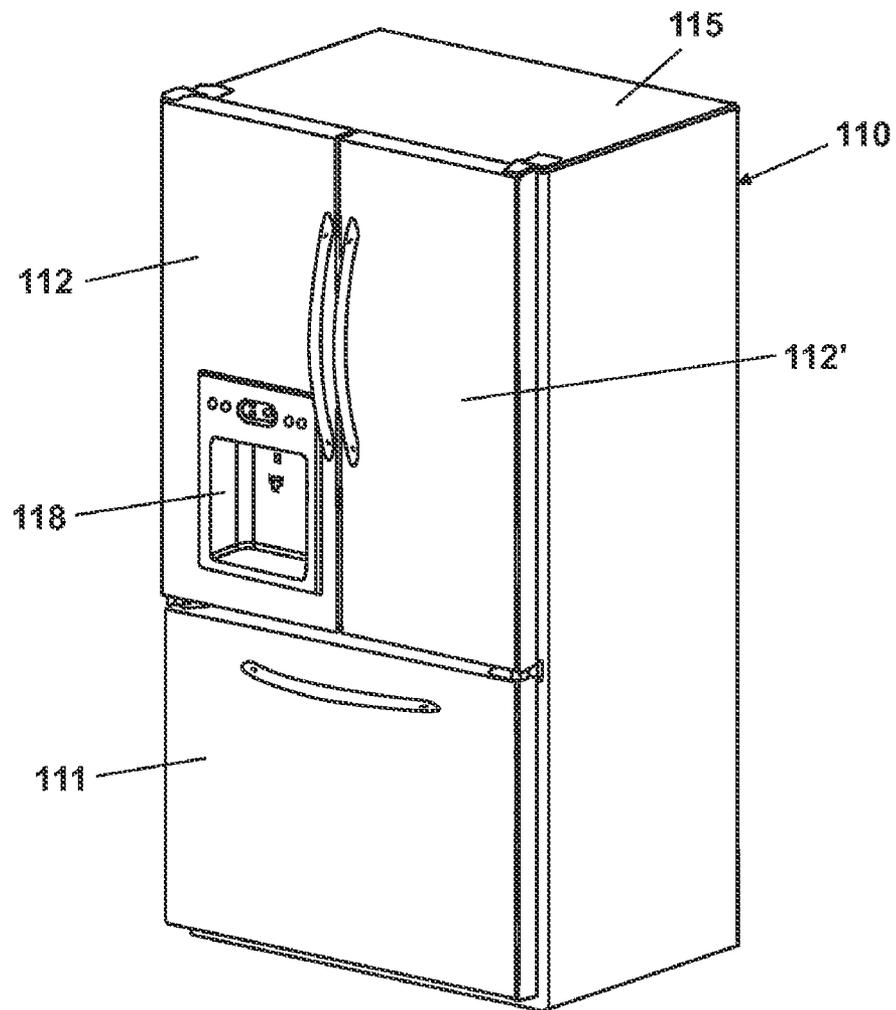


Fig. 7

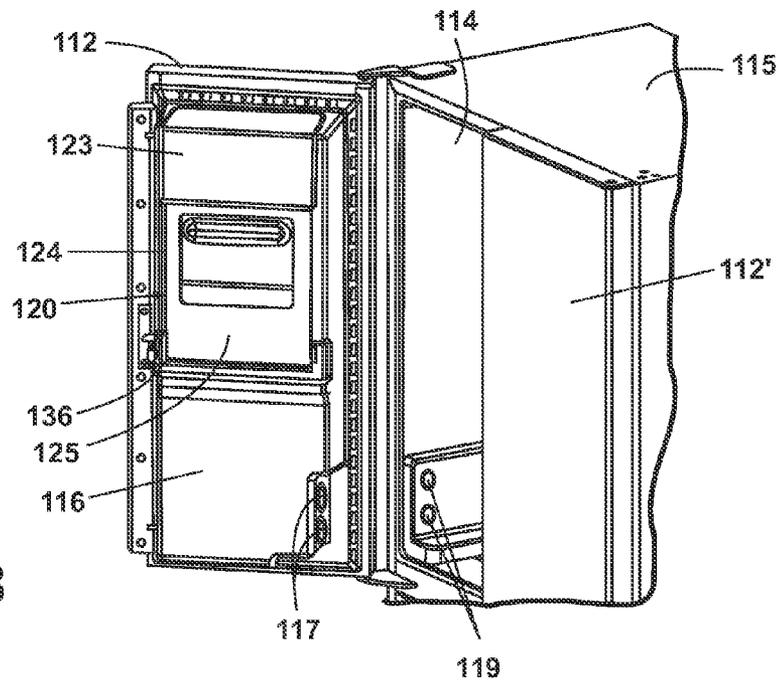


Fig. 8

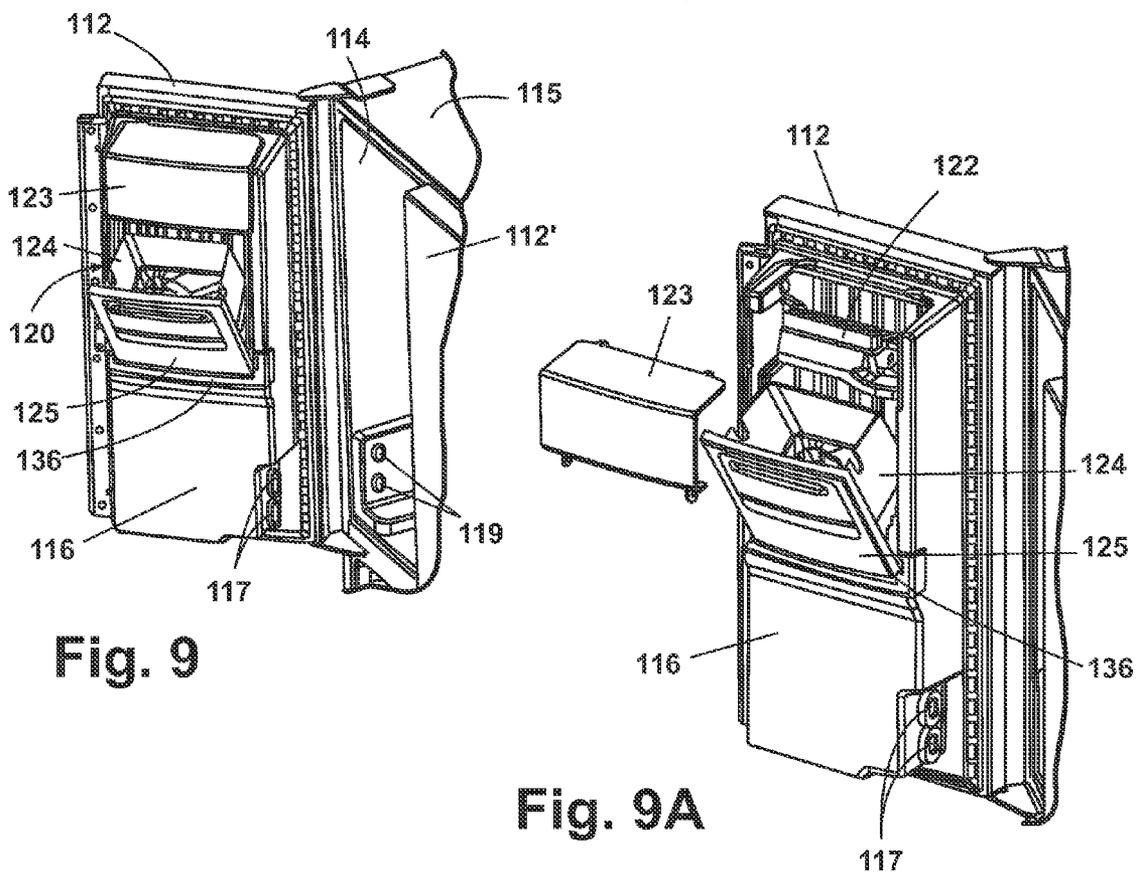


Fig. 9

Fig. 9A

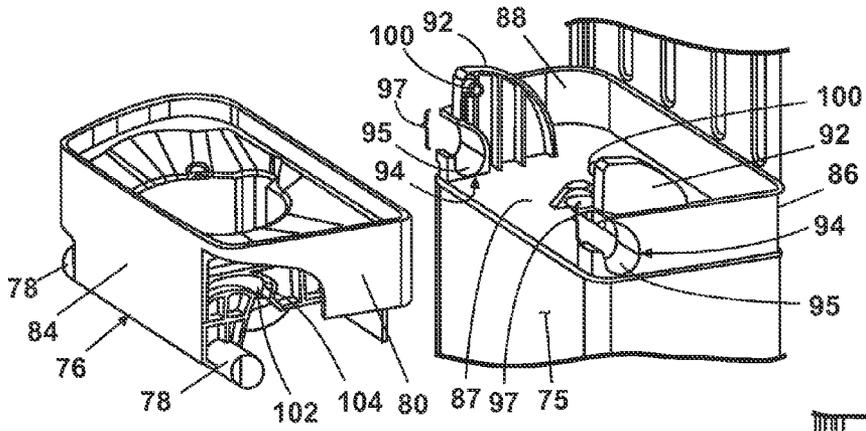


Fig. 10A

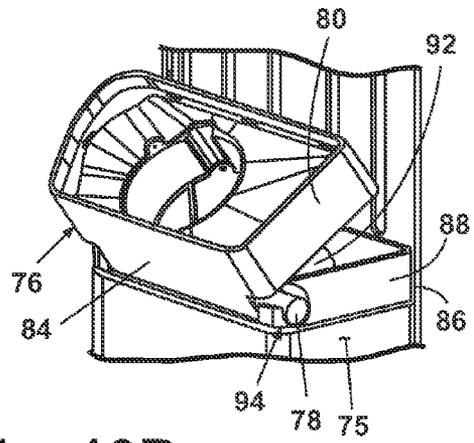


Fig. 10B

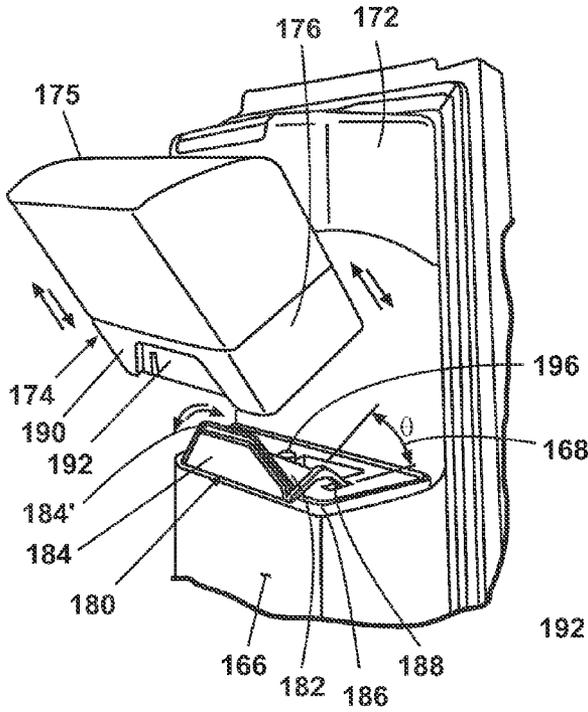


Fig. 11A

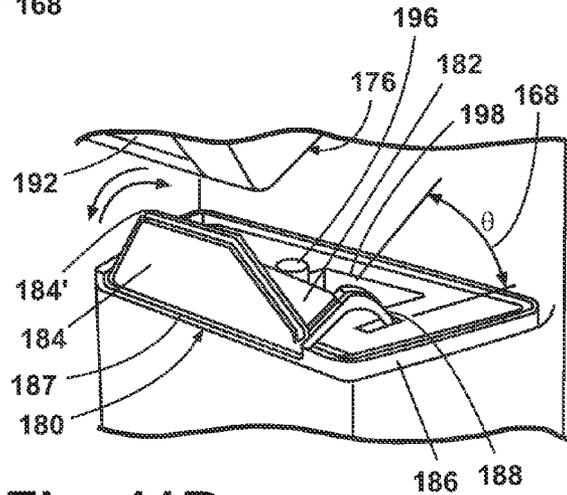


Fig. 11B

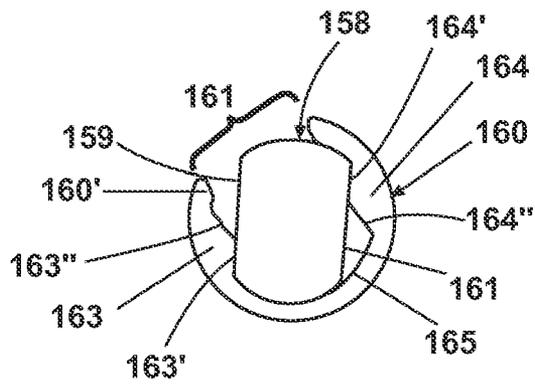


Fig. 12A

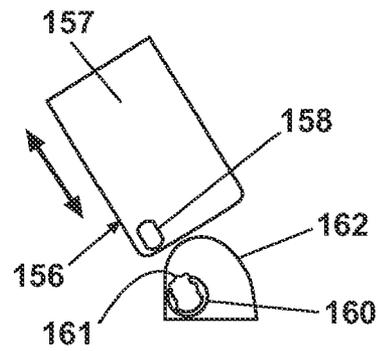


Fig. 12B

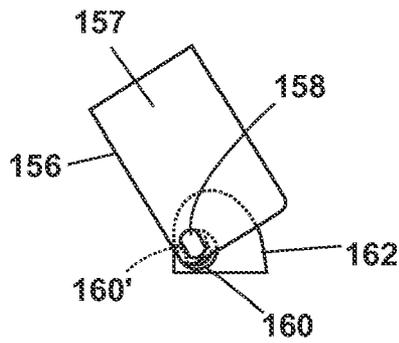


Fig. 12C

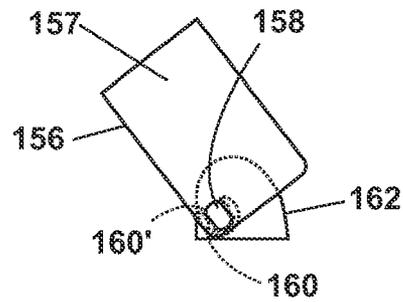


Fig. 12D

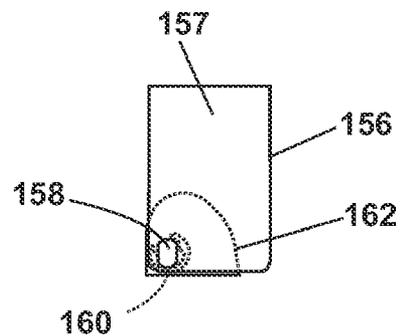


Fig. 12E

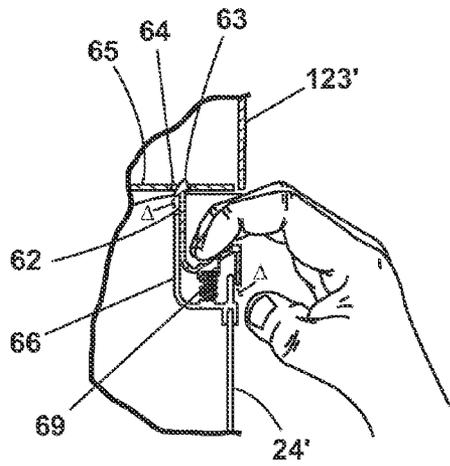


Fig. 13A

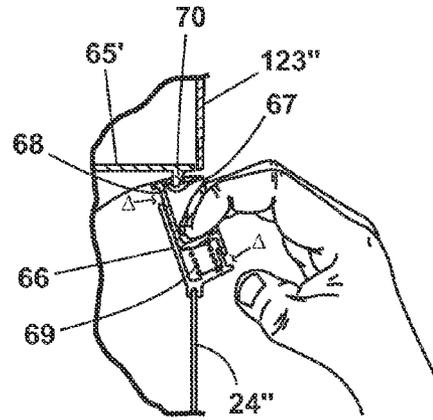


Fig. 13B

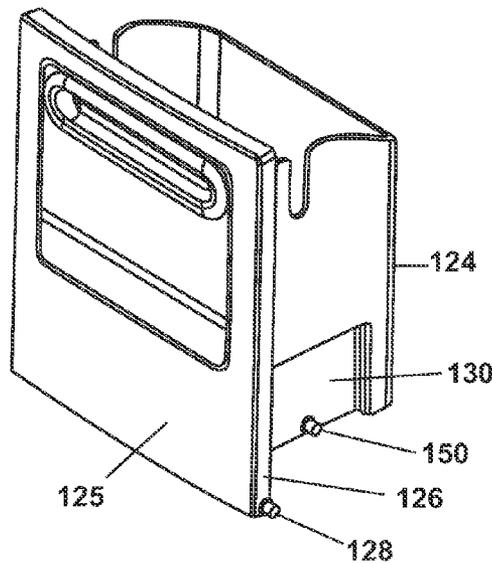


Fig. 14

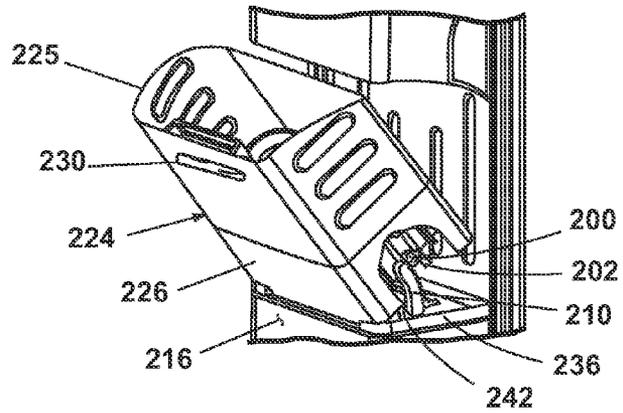


Fig. 13C

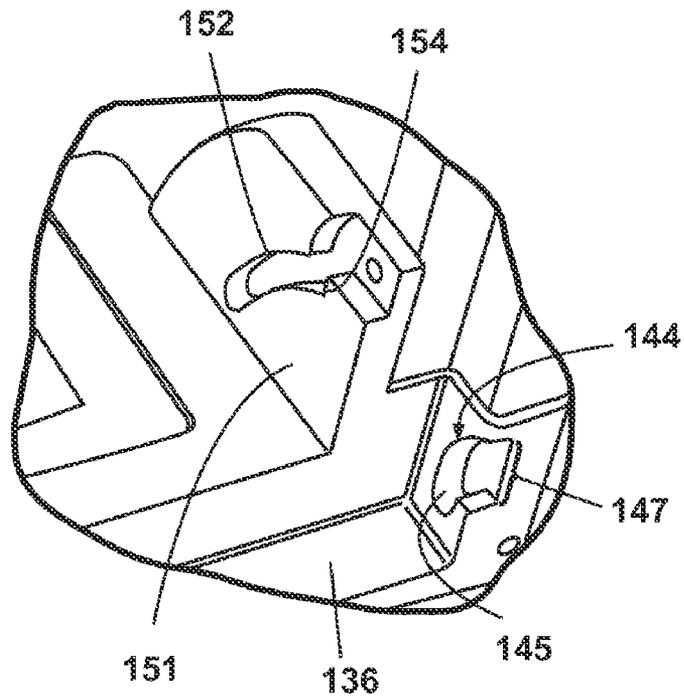


Fig. 15

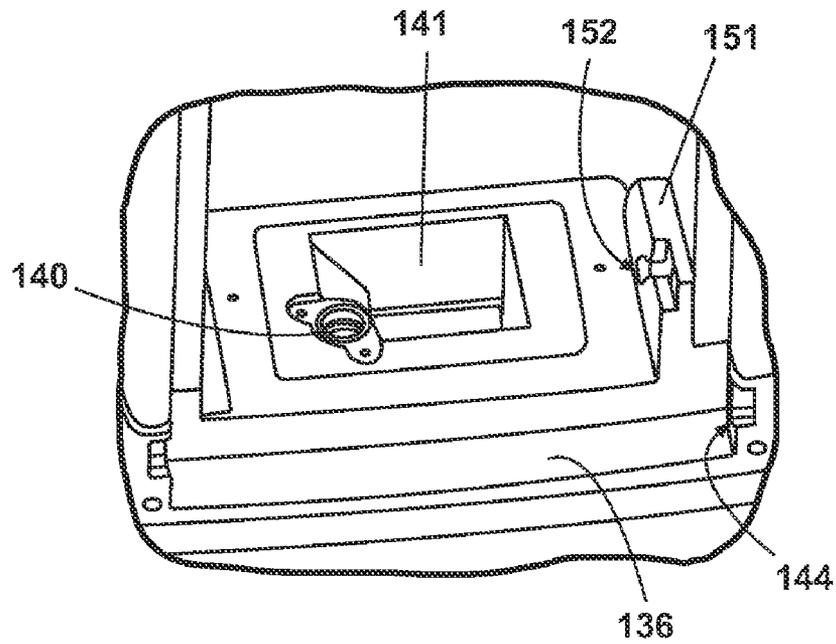


Fig. 16

TILT-OUT ICE BIN FOR REFRIGERATOR**CROSS REFERENCE TO RELATED APPLICATIONS**

This application is a continuation of pending U.S. patent application Ser. No. 11/283,970, filed Nov. 21, 2005, herein incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The invention relates to refrigerator freezers equipped with an ice dispenser. More particularly the invention relates to an ice dispenser mounted on the inside of a door closing the freezer compartment or the refrigerator compartment.

2. Description of the Invention

Refrigerator freezers having ice and water dispensers are known. Ice dispensers having an ice storage bin carried on the inside panel of one of the doors of the refrigerator freezer are also known.

SUMMARY OF THE INVENTION

In one aspect the invention relates to a refrigerator having an insulated cabinet defining a refrigerated storage space, a door pivotally mounted to the cabinet for selectively opening and closing the refrigerated storage space and having an exterior face. The refrigerator can include an ice maker in the refrigerated storage space arranged to make and harvest ice pieces and an ice delivery system on the inside of the door for dispensing ice pieces into a dispenser cavity in the exterior face of the door. The ice dispensing system can include an ice bin including a generally open top and having a bottom opening. The ice bin can be pivotally mounted below the ice maker to receive ice pieces harvested by the ice maker and to discharge ice pieces through the bottom opening and the ice delivery system in a first position, and to tilt out to permit access to ice pieces in a second position when the door is open.

The ice bin can be removed from the refrigerator in the second position.

The ice maker can be mounted on the door and can close the open top of the ice bin when the ice bin is in the first position. The ice delivery system can include a motor, the ice bin can include an auger, and the auger can be drivably connected to the motor when the ice bin is in the first position.

The ice delivery system can further include an ice bin base and the ice bin can be pivotally mounted on a generally horizontal axis to the ice bin base. The ice bin can further include a pair of pivot pins and the ice bin base can further include a pair of sockets for receiving the pivot pins to pivotally mount the ice bin to the ice bin base. The sockets can include a peripheral opening for insertion and withdrawal of the pivots into and from the sockets when the ice bin is in the second position.

The ice bin can include side walls, a front wall and a rear wall, and the pivot pins can comprise a generally D-shaped pin on each of the side walls adjacent the bottom edge of the side wall and the front wall. The sockets can comprise a support extending upwardly from the ice bin base, and can have a recess including a curvilinear wall defining the socket to receive the D-shaped pin. The D-shaped pin can comprise a curved wall and a generally flat wall. The D-shaped pin curved wall can engage the socket curvilinear wall to form a moving pivot point for the ice bin as the ice bin is pivoted from the first position to the second position.

In another aspect of the invention the ice bin can include side walls, a front wall and a rear wall, and the pivot pins can comprise a generally cylindrical pin on a side wall of the ice bin adjacent the bottom edge of the side wall and the front wall. The sockets can comprise a support extending upwardly from the ice bin base having a recess including a generally cylindrical wall defining the socket to receive the generally cylindrical pin.

In another aspect of the invention the ice bin can include side walls, a front wall and a rear wall, and the sockets can comprise a support extending upwardly from the ice bin base having a recess for receiving the pivot pin. At least one of the supports can further include a stop pin positioned above the socket, and the ice bin can further include a curved track on at least one side wall of the ice bin arranged for receiving the at least one stop pin and can have a stop surface to engage the stop pin when the ice bin is in the second position to prevent the ice bin from pivoting past the second position.

In another aspect of the invention the ice bin can include side walls, a front wall and a rear wall, and the pivot pins can comprise a shaft having opposed generally flat surfaces. The sockets can have a recess including a first stop having first and second stop surfaces to engage one of the flat surfaces and a second stop having first and second stop surfaces to engage the other flat surface. When the ice bin is in the first position the first stop surfaces engage opposite flat surfaces to prevent the shaft from rotating further toward the first position, and when the ice bin is in the second position the second stop surfaces engage opposite flat surfaces to prevent the shaft from rotating further toward the second position.

In another aspect of the invention the refrigerator can include a plate pivotally mounted on an ice bin base and the ice bin can engage the plate for pivotal movement with the plate. The plate can include a base and at least one vertical element, and the ice bin can further include a wall arranged to engage the at least one vertical element to hold the ice bin on the plate. The plate can include spaced vertical elements and the wall can include a portion received between the spaced vertical elements. The wall portion and the vertical elements can be arranged to allow the ice bin to be removed from the plate when the ice bin is in the second position.

In another aspect of the invention the ice bin can include a latch arranged to secure the ice bin in the first position under the ice maker.

In another aspect of the invention the ice bin can include a damper connected between the ice bin and the door to damp movement of the ice bin between the first position and the second position. The ice delivery system can include an ice bin base and the ice bin can be pivotally mounted to the ice bin base. The damper can comprise a viscous damper connected between the ice bin and the ice bin base.

In another aspect of the invention the refrigerator is a side by side refrigerator freezer and the ice maker can be mounted on the freezer door above the ice bin and closes the open top of the ice bin when the ice bin is in the first position.

In another aspect of the invention the refrigerator is a bottom freezer refrigerator freezer and the ice maker can be mounted on the refrigerator compartment door above the ice bin. Below freezing air can be supplied to the door for the ice maker and the ice bin. The ice maker and ice bin can include a closure arranged to enclose below freezing air supplied to the door.

In another aspect of the invention a refrigerator freezer can include a freezer compartment having an access opening and a freezer door for closing the freezer compartment. An ice maker can be positioned on the freezer door and an ice delivery system can be provided on the freezer door for dispensing

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ice pieces into a dispenser cavity in the exterior face of the freezer door. The ice delivery system can include an ice bin positioned below the ice maker and can have a generally open top, side walls, a front wall and a bottom opening. The ice delivery system can include an ice bin base mounted on the freezer door removably supporting the ice bin for pivotal movement along a generally horizontal axis between a first position with the open top closed by the ice maker to receive ice pieces harvested by the ice maker and to discharge ice pieces through the bottom opening to the dispenser cavity, and to pivot to a second position with the open top exposed to permit access to ice pieces and removal of the ice bin from the ice bin base when the freezer door is open. The ice bin can include a pair of pivot pins and the ice bin base can include a pair of sockets each having a recess comprising a curvilinear wall arranged to receive a pivot pin to pivotally mount the ice bin to the ice bin base. The sockets can include a peripheral opening into the recess for insertion and withdrawal of a pivot pin into and from the recess when the ice bin is in the second position.

In another aspect of the invention a refrigerator freezer can include a refrigerator compartment having an access opening and a refrigerator door for closing the refrigerator compartment. The refrigerator freezer can supply below freezing air to the refrigerator door. An ice maker can be positioned on the refrigerator door and an ice delivery system can be provided on the refrigerator door for dispensing ice pieces into a dispenser cavity in the exterior face of the refrigerator door. The ice delivery system can include an ice bin positioned below the ice maker and can have a generally open top, side walls, a front wall and a bottom opening. An ice bin base can be mounted on the refrigerator door removably supporting the ice bin for pivotal movement along a generally horizontal axis between a first position with the open top closed by the ice maker to receive ice pieces harvested by the ice maker and to discharge ice pieces through the bottom opening to the dispenser cavity, and to pivot to a second position with the open top exposed to permit access to ice pieces and removal of the ice bin from the ice bin base when the freezer door is open. The ice bin can include a pair of pivot pins and the ice bin base can include a pair of sockets each having a recess arranged to receive a pivot pin to pivotally mount the ice bin to the ice bin base. The sockets can include a peripheral opening into the recess for insertion and withdrawal of a pivot pin into and from the recess when the ice bin is in the second position. The ice delivery system can include a closure for the ice maker and the ice bin arranged to enclose below freezing air supplied to the refrigerator door for the ice maker and ice bin.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of a side by side refrigerator freezer having one embodiment of ice dispensing system according to the invention;

FIG. 2 is a fragmentary side view of a one embodiment of an ice dispensing system according to the invention illustrating the ice bin tilted out for access to ice pieces through the open top of the ice bin;

FIG. 2A is a fragmentary side view of the ice dispensing system embodiment illustrated in FIG. 2 with the ice bin separated from the ice dispensing system;

FIG. 3 is a fragmentary perspective view of the ice dispensing system according to the invention illustrating a latching arrangement for the ice bin;

FIG. 4 is a partial schematic view of the side wall of an ice bin according to the invention illustrating the pivot pin and bin stop of the embodiment of FIGS. 1-3 of the invention;

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FIG. 5 is a partial schematic view of the side wall of an ice bin engaging a support on an ice bin base illustrating the operation of the pivot pin of the embodiment of FIGS. 1-3 of the invention;

FIG. 5A is a partial schematic view of the side wall of an ice bin engaging a support on an ice bin base from the opposite side shown in FIG. 5 illustrating operation of the bin stop of the embodiment of FIGS. 1-3 of the invention;

FIG. 6 is a partial perspective view of an embodiment of an ice bin base according to the invention on a door;

FIG. 7 is a perspective view of a bottom freezer refrigerator freezer having an embodiment of an ice dispensing system according to the invention;

FIG. 8 is a partial perspective view of the bottom freezer refrigerator freezer of

FIG. 7 with one of the refrigerator doors partially opened illustrating the inside of the refrigerator door;

FIG. 9 is a partial perspective view of the bottom freezer refrigerator freezer of FIG. 7 with one of the refrigerator doors partially opened illustrating the ice bin tilted out for access to ice pieces through the open top of the ice bin;

FIG. 9A is a partial perspective view of the refrigerator door of FIG. 9 with the ice maker cover removed illustrating the position of the ice maker;

FIG. 10A is a partial perspective view of a lower ice bin member spaced from an ice bin base illustrating another embodiment of a pivot pin according to the invention;

FIG. 10B is a partial perspective view of the lower ice bin member and ice bin base of FIG. 10A with the lower ice bin member installed on the ice bin base;

FIG. 11A is a partial perspective view of another embodiment of ice bin and ice bin base according to the invention;

FIG. 11B is a partial perspective view of the ice bin base of the embodiment of

FIG. 11A with the ice bin spaced from the ice bin base;

FIG. 12A is a partial schematic view of another embodiment of a pivot pin and socket according to the invention;

FIG. 12B is a partial schematic view of an ice bin having a pivot pin according to the embodiment of FIG. 12A positioned for insertion into a socket;

FIG. 12C is a partial schematic view illustrating the pivot pin of FIG. 12A partially inserted into the socket;

FIG. 12D is a partial schematic view illustrating the pivot pin of FIG. 12A fully inserted into the socket with the ice bin in a tilted out position as illustrated in FIG. 2;

FIG. 12E is a partial schematic view illustrating the ice bin pivoted to an upright position as illustrated in FIG. 1;

FIG. 13A is a partial schematic view illustrating one embodiment of a latch to retain an ice bin according to the invention in an upright position as illustrated in FIG. 1;

FIG. 13B is a partial schematic view illustrating another embodiment of a latch to retain an ice bin according to the invention in an upright position as illustrated in FIG. 1;

FIG. 13C is a partial schematic view illustrating one embodiment of a damper to retain an ice bin according to the invention in an upright position as illustrated in FIG. 1;

FIG. 14 is a partial side view of an embodiment of an ice bin that can be used with the ice dispensing system embodiment of FIGS. 7-9;

FIG. 15 is a partial perspective view of an ice bin base that can be used with the ice dispensing system embodiment of FIGS. 7-9;

FIG. 16 is another partial perspective view of an ice bin base that can be used with the ice dispensing system embodiment of FIGS. 7-9.

DESCRIPTION OF THE INVENTION

One of the most desired accessories for a household refrigerator is a through-the-door ice and water system. A through-the-door ice and water dispenser is desirable because it greatly simplifies the process of retrieving ice cubes, i.e. it eliminates opening the door, removing the ice cube storage bin, separating and scooping ice cubes, and pouring the ice cubes into a glass. The feature also can be viewed as an energy saver, since the freezer door is not opened as often.

In today's household refrigerator market, there are three basic configurations to choose from: a bottom freezer refrigerator in which the refrigerator compartment is located above the freezer compartment, a top-mount refrigerator in which the freezer compartment is located above the refrigerator compartment, and a side by side refrigerator in which the refrigerator compartment and the freezer compartment extend the entire height of the refrigerator.

In the side by side configuration the ice cube storage bin and dispenser can be positioned on the freezer compartment door. It would be advantageous to also position the ice maker on the freezer door to provide additional shelf storage space in the freezer compartment. Likewise, it would be desirable to provide ice and water dispensers for bottom freezer refrigerators. However, to do so essentially requires providing ice making and storage mechanisms in the refrigerator compartment or on a refrigerator compartment door. Related co-pending U.S. patent application Ser. No. 10/973,559 is directed to ice makers arranged for installation and operation on a refrigerator or freezer compartment door. Co-pending U.S. patent application Ser. No. 10/973,559 is incorporated herein by reference.

U.S. Pat. Nos. 6,050,097, 6,082,130 and 6,148,624 disclose refrigerator freezers with an ice bin positioned on the freezer compartment door. In the ice dispensing system embodiments described in U.S. Pat. Nos. 6,050,097 and 6,082,130 an ice maker can be positioned on the top wall of the freezer compartment and an ice bin can be removable from the freezer door to allow the user to readily remove the ice bin and dump a large quantity of ice into a receptacle. In the embodiment described in U.S. Pat. No. 6,148,624 the ice maker can be raised out of the ice storage receptacle to allow the ice storage receptacle to pivot out from under the ice maker on a vertical axis and, if desired, be removed from the freezer door.

Turning to FIGS. 1-3, an ice dispensing system 20 according to the invention can be seen. In the embodiment illustrated in FIGS. 1-3 refrigerator freezer 10 can be a side by side refrigerator freezer having a freezer compartment door 11 and a refrigerator compartment door 12 pivotally mounted on cabinet 15 as is well known in the art. Freezer compartment door 11 can close freezer compartment 13 as is well known in the prior art. An ice maker 22, enclosed by ice maker cover 22' can be mounted at the top of freezer door 11 and can have water and electric leads, not shown, provided through a hollow hinge pin, not shown, from cabinet 15. Ice maker 22 can produce and harvest ice pieces automatically as is well known in the art. Ice maker 22 can be an ice maker as disclosed in related U.S. patent application Ser. No. 10/973,559 incorporated by reference in this application. Ice maker 22 can be similar to ice maker 122' in FIG. 9A described below.

An ice bin 24 can be positioned below ice maker 22 to receive ice pieces harvested by ice maker 22. Ice bin 24 can have an upper ice bin member 25 that can be clear plastic material to allow a user to visually determine the amount of ice in upper ice bin member 25. Ice bin 24 can also have a lower ice bin member 26. Lower ice bin member 26 can

support desired ice dispensing mechanism and can include a funnel wall portion, not shown, and a bottom opening, not shown, for ice pieces being dispensed. U.S. Pat. Nos. 6,050,097 and 6,082,130, incorporated by reference herein, disclose a lower ice bin member and ice dispensing mechanism that can be incorporated in lower ice bin member 26 for causing ice to be dispensed from ice bin 24 through freezer door 11 into a dispenser cavity, not shown, on the face of door 11. The dispenser cavity, not shown, on the face of freezer compartment door 11 can be similar to dispenser cavity 118 in FIG. 7. Inner door panel 16 can enclose a motor, motor housing and drive arrangement, all not shown, that can be arranged to drive ice dispensing system 20. A motor, motor housing and drive arrangement similar to the motor, motor housing and drive arrangement disclosed in U.S. Pat. Nos. 6,050,097 and 6,082,130 can be used in ice dispensing system 20.

In the closed position illustrated in FIGS. 1 and 3, ice bin 24 can receive ice pieces from ice maker 22. Ice maker 22 can have a housing with an curved edge 23 that can generally match the top edge 27 of upper ice bin member 25 to substantially enclose ice bin 24 when ice bin 24 is in the closed position illustrated in FIGS. 1 and 3 with ice bin cover 22' closed. As described in U.S. Pat. Nos. 6,050,097 and 6,082,130 ice bin 24 can include an auger 32 that can be driven by the ice dispensing mechanism, not shown, in lower ice bin member 26 when the dispensing mechanism is operated. Auger 32 can agitate ice pieces in upper ice bin member 25 to facilitate ice pieces falling into the ice dispensing mechanism for dispensing into the dispenser cavity, not shown. Unlike the ice bins shown in U.S. Pat. Nos. 6,050,097 and 6,082,130, ice bin 24 can not be lifted vertically for removal from ice dispensing system 20. As mentioned above, it can be convenient for a user to remove an ice bin for bulk dispensing of ice pieces into a cooler, or for cleaning the ice bin. According to the invention ice bin 24 can be pivotally mounted to the ice dispensing system 20 about a generally horizontal axis for movement between the closed position illustrated in FIGS. 1 and 3 to a tilted out position illustrated in FIG. 2. In the tilted out position ice pieces can be manually removed by reaching into the open top of upper ice bin member 25. Further, in the tilted out position ice bin 24 can be removed from ice dispensing system 20 for bulk dispensing of ice into a cooler or other container or for cleaning as desired, see FIG. 2A.

Turning to FIG. 6 the pivotal mounting for ice bin 24 can be seen in greater detail. Ice bin base 36 can have a generally flat portion 37 that can provide a support for ice bin 24. Flat portion 37 can have a peripheral wall 38 extending around a substantial portion of flat portion 37 to provide a seat for ice bin 24. Peripheral wall 38 can hold ice bin 24 in proper alignment with drive coupling 40. Drive coupling 40 can connect to a drive for auger 32 and dispensing mechanism, not shown, in lower ice bin member 26 to a motor, not shown, that can be positioned below ice bin base 36. Those skilled in the art will understand that lower ice bin member 26 can have a complimentary drive coupling, not shown. The complimentary drive coupling, not shown, can connect the ice dispensing mechanism, not shown, in lower ice bin member 26 and auger 32 to drive coupling 40 when ice bin 24 is in the position shown in FIGS. 1 and 3. Further, those skilled in the art will understand that the complimentary drive coupling, not shown, can be arranged to readily engage drive coupling 40 as ice bin 24 is tipped from the tilted position shown in FIG. 2 to the position in FIG. 1 without user intervention. For example drive coupling 40 can be a coupling such as used in the ice dispensing systems described in U.S. Pat. Nos. 6,050,097 and 6,082,130. Ice bin base 36 can also have a chute 41 formed in flat surface 37 that can lead to a dispensing cavity, not shown,

on the exterior face of freezer door **11** that can be similar to dispensing cavity **118** in FIG. 7.

Turning to FIGS. 4-5A the relationship between ice bin base **36** and ice bin side walls **30** can be seen in schematic form with portions of the ice bin base **36** and ice bin **24** removed to show the edge of ice bin base **36**, supports **42** and the side wall **30** of ice bin **24**. Ice bin base **36** can include a pair of supports **42** positioned at the edge of ice bin base **36** away from the exterior face of freezer compartment door **11**. Supports **42** can include a recess forming a socket **44** that can receive a pivot pin **28** positioned on a side wall **30** adjacent the bottom edge **31** and front wall **34**. In the embodiment of FIGS. 1-6, pivot pin **28** can be D-shaped having a curved wall **46** and a generally flat wall **48**. Socket **44** can include a curvilinear wall **45** defining the recess. Socket **44** can also have a peripheral opening **47** that can allow a pivot pin **28** to be inserted into or withdrawn from socket **44** when ice bin **24** is in the position shown in FIG. 2. Curved wall **46** can engage curvilinear wall **45** (see FIG. 5) to form a pivot point as ice bin **24** is pivoted from the position shown in FIG. 1 to the position shown in FIGS. 2, 5 and 5A. The pivot point formed by the engagement of curved wall **46** and curvilinear wall **45** can be a moving pivot point that can move upwardly as ice bin **24** is tilted from the FIG. 1 position to the FIG. 2 position. A moving pivot point can allow front wall **34** of ice bin **24** to be positioned close to ice bin base **36** to minimize the space between ice bin **24** and ice bin base **36**. Those skilled in the art will understand that a fixed pivot point for ice bin **24** could require larger gap between lower ice bin member **26** and ice bin base **36** to avoid interference of lower ice bin member **26** with ice bin base **36** as ice bin **24** is tilted to the FIG. 2 position.

Support **42** can also include a stop pin **50** that can be positioned above socket **44**. Stop pin **50** can be received in a curved track **52** that can be formed in side wall **30** on at least one side of lower ice bin member **26**. A stop pin **50** and curved track **52** can be provided for both sides **30** of lower ice bin member **30**. Curved track **52** can include a stop surface **54** to engage stop pin **50** when ice bin **24** is tilted to the FIGS. 2, 5 and 5A position. Stop pin **50** and stop surface **54** can be designed sufficiently strong to support ice bin **24** in the FIG. 2 position without moving past the FIG. 2 position and inadvertently discharging the ice pieces. The configuration of curved track **52**, pivot pin **28** and peripheral opening **47** can be arranged to allow ice bin **24** to be easily lifted off ice bin base **36** when ice bin **24** is in the FIG. 2 position by withdrawing ice bin **24** upwardly in a direction generally parallel to the sides of ice bin **24**, see FIG. 2A. As can best be seen in FIG. 5A, pivot pin **28** can pass through peripheral opening **47** and stop pin **50** can pass through the flared entrance **56** to curved track **54** when ice bin **24** is positioned in the FIG. 2 position. Thus, while ice bin **24** can be easily removed from ice bin base **36** in the FIG. 2 position, the configuration of pivot pin **28**, socket **44** and stop pin **50** and stop surface **54** can assure that ice bin **24** can not tilt further than the FIG. 2 position and discharge ice pieces on the floor or drop from freezer compartment door unexpectedly.

Returning to FIG. 6, generally flat portion **37** of ice bin base **36** can comprise a stop **58** having a front edge **59** that can be positioned to engage the inside surface, not shown, of front wall **34** of lower ice bin member **26** when ice bin **24** is in the FIG. 2 position. Stop **58** engaging the inside of front wall **30** can supplement stop pins **50** engaging stop surfaces **54** in assuring that an excess load placed on ice bin **24** in the FIG. 2 position will not cause ice bin **24** to tilt past the FIG. 2 position.

Turning to FIGS. 7-9A another embodiment of the invention can be seen. Refrigerator freezer **110** can have a bottom freezer configuration. Refrigerator freezer **110** can have a cabinet **115** arranged to have an upper refrigerator compartment **114** with refrigerator doors **112** and **112'** pivotally mounted to cabinet **115** as is well known in the art. Those skilled in the art will understand that refrigerator compartment **114** can be provided with a single door instead of the double door **112** and **112'** shown in FIGS. 7-9. Refrigerator **110** can have an ice dispensing system **120** that can be mounted on refrigerator door **112**. Ice dispensing system **120** can include a dispenser cavity **118** on the face of refrigerator door **112**. Ice dispensing system can include an ice maker **122** behind ice maker cover **123** at the top of refrigerator door **112**, see FIG. 9A. Ice bin cover **123** can be insulated. Ice bin **124** can be pivotally mounted on ice bin base **136** as will be described in greater detail below. Ice bin **124** can have an insulated cover **125**. Door **112** can have an inner door panel **116** that can form a housing below ice maker **122** and ice bin **124**. Refrigerator **110** can be arranged to provide below freezing air to refrigerator door **112** through door air couplings **117** and cabinet air couplings **119**. The system for providing below freezing air to ice maker **122** and ice bin **124** can be an air delivery system described in detail in related co-pending U.S. patent application Ser. No. 10/973,543. U.S. patent application Ser. No. 10/973,543 is fully incorporated by reference and the air delivery system will not be described in detail in this application. Ice maker cover **123** and ice bin door **125** can be insulated and can enclose the ice maker **122** and ice bin **124** to maintain the ice maker **122** and ice bin **124** at below freezing temperatures. The below freezing enclosure can be arranged for minimum leakage of below freezing air into refrigerator compartment **114** as described in the above referenced co-pending patent application.

Ice bin **124** can be pivotally mounted to ice bin base **136** for movement between the position in FIG. 8 to the tilted out position in FIGS. 9 and 9A. As in the embodiment of FIGS. 1-6, ice bin **124** can be removed from refrigerator compartment door **112** when ice bin **124** is in the FIG. 9 position. Turning to FIGS. 14-16, ice bin **124** can have ice bin door **125** connected to ice bin **124**. Ice bin door **125** can include pivot pins **128** that can be positioned at the bottom of ice bin door edges **126**. Inner door panel **116** can have an ice bin base **136** mounted to support ice bin **124** in position below ice maker **122** and ice maker cover **123**. Ice bin base **136** can include a pair of sockets **144** having a recess defined by a curved wall **145** that can have a peripheral opening **147**. Peripheral opening **147** can allow pivot pin **128** to be inserted into and withdrawn from socket **144** when ice bin **124** and ice bin door **125** are in the FIG. 9 position. Pivot pin **128** can be a round pin as shown in FIG. 14.

Ice bin **124** can have a stop pin **150** on side wall **130**. Stop pin **150** can be positioned on side wall **130** to engage track **152** in bin stop **151** positioned on ice bin base **136** inwardly from sockets **144**. Track **152** can include stop surface **154** that can be positioned to engage stop pin **150** when ice bin **124** and ice bin door **125** are in the FIG. 9 position. Those skilled in the art will understand that stop pin **150** and stop surface **154** can function similar to stop pin **50** and stop surface **54** in the embodiment of FIGS. 1-6. In the embodiment of FIGS. 7-9 and 14-16 a stop pin **150** and stop surface **154** can be provided on one side of ice bin **124**. Those skilled in the art will understand that, if desired, a stop pin **150** and stop surface **154** can be provided on both sides of ice bin **124**.

Referring to FIGS. 10A and 10B another embodiment of a lower ice bin member **76** and ice bin base **86** can be seen. Lower ice bin member **76** can be generally similar to lower ice

bin member 26 and can include dispensing mechanism, not shown. As in the embodiment of the invention in FIGS. 1-6 the dispensing mechanism can be similar to the dispensing mechanism disclosed in U.S. Pat. Nos. 6,050,097 and 6,082,130 incorporated herein by reference. Ice bin base 86 can be generally similar to ice bin base 36 and can include a flat portion 87 and peripheral wall 88 that can provide a socket for lower ice bin member 76. Ice bin base 86 can include supports 92 that can include a socket 94. Sockets 94 can include a curved wall 95 having a peripheral opening 97 that can be arranged to receive pivot pin 78. Lower ice bin base 76 can have pivot pins 78 on the lower edge of side wall 80 adjacent front wall 84. In the embodiment of FIG. 10 and 10A, pivot pin 76 can be generally cylindrical similar to pivot pin 128 in FIG. 14. Supports 92 can also include a stop pin 100 that can be spaced above socket 94 similar to stop pin 50 in the embodiment of FIGS. 1-6. Lower ice bin member 76 can have a track 102 formed inside side wall 80. Side wall 80 is partially cut away in FIG. 10A to expose track 102. Track 102 can be similar to track 50 in the embodiment of FIGS. 1-6. As in the case of the embodiment of FIGS. 1-6, supports 92 on both sides of lower ice bin member 76 can have a stop pin 100. Track 102 can have a stop surface 104 arranged to engage stop pin 100 when ice bin base 76 is in a tilted out position similar to ice bin 24 in FIG. 2.

Turning to FIGS. 11A and 11B another embodiment of an ice bin 174 and ice bin base 186 can be seen. Ice bin 174 can be generally similar to ice bin 24 in the embodiment of FIGS. 1-6 except for the mounting arrangement to ice bin base 186. Ice bin base 186 can be mounted to inner door panel 166. Ice bin base 186 can have a plate 180 pivotally connected to ice bin base 186. Those skilled in the art will understand that plate 180 can be hinged to ice bin base 186 along an axis generally parallel to the front edge 187 of ice bin base 186. Plate 180 can have a base 182 that can be arranged to support ice bin 174. Plate 180 can also have spaced vertical elements 184 and 184' that can be positioned generally above the front edge of ice bin base 186. Lower ice bin member 176 can have a front wall 190 that can have a wall portion 192 that can be configured to be received between vertical elements 184 and 184' to hold ice bin 174 on plate 180. Plate 180 can have an arm 188 that can project downward into ice bin base 186 and can include a stop, not shown, on the distal end that can limit pivoting of plate 180 to a pivot angle 168. Those skilled in the art will understand that the stop on the distal end of arm 188 can engage the undersurface of ice bin base 186 or other surface as desired. Arm 188 can limit rotation of plate 180 to pivot angle 168 that can correspond to the pivot angle between the ice bin positions of FIG. 1 and FIG. 2.

Turning to FIGS. 12A-12E another embodiment of a pivot pin and socket can be seen in schematic form removed from the inner door of a refrigerator or freezer compartment. In this embodiment ice bin 156 can have a side wall 157 that can have a pivot pin 158 extending from the lower edge of side wall 157 adjacent the front wall of ice bin 156. Ice bin 156 can otherwise be similar to ice bin 24 in the embodiment of FIGS. 1-6. Pivot pin 158 can be a shaft having opposed generally flat surfaces 159 and 161, see FIG. 12A. An ice bin base, not shown, that can be generally similar to ice bin base 136 can have supports 162 that can include sockets 160. Sockets 160 can have a generally cylindrical inner wall 165 that can have a first stop 163 and a second stop 164 that can engage the generally flat surfaces 159 and 161 of pivot pin 158. Sockets 160 can also have a locking tip 160' to engage pivot pin 158 when ice bin 156 is in the tilted out position illustrated in FIG. 12D to preclude ice bin 156 from disconnecting from the ice bin base unexpectedly. First stop 163 can have a first stop

surface 163' and a second stop surface 163". Similarly, second stop 164 can have a first stop surface 164' and a second stop surface 164". When ice bin 156 is in the first position, FIG. 12E, generally flat wall 159 can engage first stop surface 163' and generally flat wall 161 can engage first stop surface 164' to prevent ice bin 156 from rotating further in the clockwise direction past the FIG. 12E position. Similarly, generally flat wall 159 can engage stop 163" and generally flat wall 161 can engage stop 164" to prevent ice bin 156 from rotating further in the counterclockwise position past the FIG. 12D position. Referring to FIGS. 12B-12D installation and removal of ice bin 156 can be seen. As illustrated in FIG. 12B, ice bin 156 can be positioned above socket 160 with generally flat side walls 159 and 161 aligned with peripheral opening 161. As shown in FIG. 12B and 12C pivot pins 158 can be inserted into socket 160 with generally flat walls 159 and 161 passing between stop surfaces 163' and 164' and locking tip 160'. When pivot pins 158 are fully inserted into sockets 160, the ice bin can be rotated to the FIG. 12D position. Ice bin 156 can be pivoted between the FIG. 12D and FIG. 12E positions as in the embodiments described above. In order to remove ice bin 156, a user can rotate the ice bin to the FIG. 12C position so that pivot pins 158 can slide past locking tip 160'.

Any of the ice bin embodiments described above can be provided with a latch or a damper to secure the ice bin in position under the ice maker to assure that the ice bin does not pivot open when the door on which the ice dispenser system is mounted is opened, particular if the door is opened rapidly. Turning to FIGS. 13A and 13B two embodiments of a latch can be seen. In FIG. 13A, ice bin 24' can have a latch housing 60 provided in the upper portion of ice bin 24'. A latch 62 can be slidably mounted in latch housing 66 and can be spring biased upwardly by spring 69. Tip 63 of latch 62 can engage a strike 64 that can be formed in ice maker support 65 adjacent ice maker cover 123'. In order to release ice bin 24' to pivot outwardly to the FIG. 2 position the user can depress latch 62 to withdraw tip 63 from the strike 64 in ice maker support 65 freeing ice bin 24' to pivot outwardly. Similarly, in the embodiment of FIG. 13B, ice bin 24" can have a latch housing 66 provided in the upper portion of ice bin 24" adjacent ice maker cover 123". Latch housing 66 can have a latch 68 slideably mounted in latch housing 66 and can have a spring 69 biasing latch 68 upwardly. Ice maker support 65' can have a stop 70 that can engage strike 67 formed in the top surface of latch 68 to hold ice bin 24" in the FIG. 1 position. In order to disengage latch 68, a user can depress latch 68 allowing strike 67 to pass under stop 70 so that ice bin 24" can tilt outwardly to the FIG. 2 position. Those skilled in the art will understand that other well known latch arrangements can be used in lieu of the latch embodiments of FIGS. 13A and 13B.

Turning to FIG. 13C another embodiment of an arrangement to assure that the ice bin does not pivot open when the door on which the ice dispenser system is mounted is opened, particular if the door is opened rapidly can be seen. Ice bin 224 can be pivotally mounted on supports 242 on ice bin base 236 in a manner similar to the embodiments described above. Ice bin 224 can include lower ice bin member 226 and upper ice bin member 225 that can be similar to the embodiments described above. Upper ice bin member 225 can include a handle 230. Lower ice bin member 226 can include a side wall 228 that is partially cut away in FIG. 13C to illustrate one damper embodiment. In FIG. 13C a damper 200 can be seen mounted on lower ice bin member 226 and can be arranged to engage curved rack 210 that can be positioned on ice bin base 236. The curvature of rack 210 can be arranged so that damper 200 can engage rack 210 as ice bin 224 moves between the position of FIG. 13C to the FIGS. 1 and 3 position. In the

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embodiment of FIG. 13C damper 200 can be a well known fluid damper. Damper 200 can include a gear 202 that can be connected to a disk contained in a housing, not shown, containing a viscous fluid. Rotation of gear 202 can rotate the disk in the viscous fluid so that damper 200 can slow the movement of ice bin 224 between the FIG. 1 position to the FIG. 2 position to provide a smooth steady opening and closing motion of ice bin 224. In addition, damper 200 can eliminate the need to provide a latch as illustrated in the embodiments of FIGS. 13A and 13B by requiring a user to initiate motion of ice bin 224. Those skilled in the art will appreciate that damper 200 can be other well known damper arrangements including pneumatic, hydraulic and mechanical dampers instead of a viscous damper as described above. In operation a user can grasp ice bin handle 230 to move ice bin 224 between the FIG. 1 and FIG. 2 positions. Damper 200 can allow ice bin 224 to move smoothly between the FIG. 1 and FIG. 2 positions without opening or closing hard. Those skilled in the art will understand that the ice bin illustrated in FIG. 13C can also be provided with a spring biased push-push latch so that ice bin 224 can be released from the FIG. 1 position by pressing on ice bin 224 to release the ice bin and allow the ice bin to move to the FIG. 2 position under the control of damper 200. While damper 200 is shown in FIG. 13C connected between the lower ice bin member 226 and ice bin base 236, those skilled in the art will understand that a damper can be mounted and connected as desired to smooth the motion of ice bin 224. Likewise those skilled in the art will readily understand that the other ice dispenser system embodiments described above can be provided with a damper to improve a user's experience with the ice dispensing system and also to help prevent accidental opening of a ice bin as a freezer door is moved between the open and closed positions.

While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation, and the scope of the appended claims should be construed as broadly as the prior art will permit.

What is claimed is:

1. A refrigerator comprising:
 - an insulated cabinet;
 - a fresh food compartment disposed within the insulated cabinet;
 - a door for providing access to the fresh food compartment;
 - an ice bin at the door;
 - an ice bin base on the door;
 - a first pivot pin operatively connected to the ice bin on a first side wall of the ice bin;
 - a second pivot pin operatively connected to the ice bin on a second side wall of the ice bin;
 - a first track on the ice bin base for engaging the first pivot pin;
 - a second track on the ice bin base for engaging the second pivot pin;
 - an open end on each of the first track for receiving the first pivot pin and an open end on the second track for receiving the second pivot pin thereby allowing removal and replacement of the ice bin from the door;
 - wherein the first track having a stop surface to thereby allow tilting open of the ice bin until the first pin engages the stop surface;
 - wherein the first pivot pin engages a curvilinear wall of the first track to form a first moving pivot point for the ice bin; and
 - wherein the second pivot pin engages a curvilinear wall of the second track to form a second moving pivot point for the ice bin.

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2. The refrigerator of claim 1 wherein the first pivot pin and the second pivot pin provide for pivotally opening the ice bin.

3. The refrigerator of claim 1 wherein the second track having a stop surface.

4. The refrigerator of claim 1 wherein the tilting open being sufficient for removal of ice from the ice bin without the removal of the ice bin from the door.

5. The refrigerator of claim 1 further comprising a freezer compartment disposed within the insulated cabinet, the freezer compartment disposed beneath the fresh food compartment.

6. The refrigerator of claim 1 wherein the first pivot pin and the second pivot pin being D-shaped.

7. A refrigerator comprising:

- an insulated cabinet;
- a fresh food compartment disposed within the insulated cabinet;
- a door for providing access to the fresh food compartment;
- an ice bin at the door;
- an ice bin base on the door;
- a first pivot pin operatively connected to the ice bin on a first side wall of the ice bin;
- a second pivot pin operatively connected to the ice bin on a second side wall of the ice bin;
- a first track on the ice bin base for engaging the first pivot pin;
- a second track on the ice bin base for engaging the second pivot pin;
- an open end on each of the first track for receiving the first pivot pin and an open end on the second track for receiving the second pivot pin thereby allowing removal and replacement of the ice bin from the door;
- wherein the first track having a stop surface to thereby allow tilting open of the ice bin until the first pin engages the stop surface;
- wherein the first pivot pin and the second pivot pin each comprise a curved wall and a generally flat wall, and wherein the curved wall of the first pivot pin engages a curvilinear wall of the first track to form a moving pivot point for the ice bin as the ice bin is pivoted from a closed position to an open position.

8. A refrigerator comprising:

- an insulated cabinet;
- a fresh food compartment disposed within the insulated cabinet;
- a door for providing access to the fresh food compartment;
- an ice bin at the door;
- an ice bin base on the door;
- a first pivot pin operatively connected to the ice bin on a first side wall of the ice bin;
- a second pivot pin operatively connected to the ice bin on a second side wall of the ice bin;
- a first track on the ice bin base for engaging the first pivot pin;
- a second track on the ice bin base for engaging the second pivot pin;
- an open end on each of the first track for receiving the first pivot pin and an open end on the second track for receiving the second pivot pin thereby allowing removal and replacement of the ice bin from the door;
- wherein the first track having a stop surface to thereby allow tilting open of the ice bin until the first pin engages the stop surface;
- wherein the first pivot pin and the second pivot pin each comprise a curved wall and a generally flat wall, and wherein the curved wall of the second pivot pin engages a curvilinear wall of the second track to form a moving

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pivot point for the ice bin as the ice bin is pivoted from a closed position to an open position.

9. The refrigerator of claim 1 wherein the first pivot pin and the second pivot pin being cylindrically shaped.

10. The refrigerator of claim 1 further comprising a second door for providing access to the fresh food compartment.

11. The refrigerator of claim 1 further comprising a conduit for supplying below freezing air to the ice bin at the door.

12. The refrigerator of claim 1 further comprising an ice maker positioned above the ice bin for making ice conveyed to the ice bin.

13. The refrigerator of claim 1 further comprising an insulated ice bin door forming a front surface of the ice bin.

14. The refrigerator of claim 13 further comprising a latch mechanism operatively connected to the ice bin door and adapted to latch the ice bin in place when the ice bin is in a closed position.

15. A refrigerator comprising:

an insulated cabinet;

a fresh food compartment disposed within the insulated cabinet;

a door for providing access to the fresh food compartment; an ice bin at the door;

an ice bin base on the door;

an ice maker positioned on the door above the ice bin and the ice bin base;

a first pivot pin operatively connected to the ice bin on a first side wall of the ice bin;

a second pivot pin operatively connected to the ice bin on a second side wall of the ice bin;

a first track on the ice bin base for engaging the first pivot pin;

a second track on the ice bin base for engaging the second pivot pin;

an open end on each of the first track for receiving the first pivot pin and an open end on the second track for receiving the second pivot pin thereby allowing removal and replacement of the ice bin from the door;

wherein the first track having a stop surface to thereby allow tilting open of the ice bin until the first pin engages the stop surface;

wherein the first pivot pin engages a curvilinear wall of the first track to form a first moving pivot point for the ice bin; and

wherein the second pivot pin engages a curvilinear wall of the second track to form a second moving pivot point for the ice bin.

16. The refrigerator of claim 15 further comprising an insulated ice bin door forming a front surface of the ice bin.

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17. The refrigerator of claim 16 further comprising a latch mechanism operatively connected to the ice bin door and adapted to latch the ice bin in place when the ice bin is in a closed position.

18. The refrigerator of claim 15 further comprising a conduit for supplying below freezing air to the ice bin at the door.

19. The refrigerator of claim 15 further comprising an insulated ice maker door configured to maintain the ice maker at below freezing temperatures.

20. A refrigerator comprising:

an insulated cabinet;

a fresh food compartment disposed within the insulated cabinet;

a freezer compartment disposed within the insulated cabinet, the freezer compartment positioned below the fresh food compartment;

a door for providing access to the fresh food compartment; an ice dispenser cavity in an exterior face of the door;

an ice bin at the door;

an ice bin base on the door;

an ice maker positioned on the door above the ice bin and the ice bin base;

an insulated ice maker door configured to maintain the ice maker at below freezing temperatures;

a first pivot pin operatively connected to the ice bin on a first side wall of the ice bin;

a second pivot pin operatively connected to the ice bin on a second side wall of the ice bin;

a first track on the ice bin base for engaging the first pivot pin;

a second track on the ice bin base for engaging the second pivot pin;

an open end on each of the first track for receiving the first pivot pin and an open end on the second track for receiving the second pivot pin thereby allowing removal and replacement of the ice bin from the door;

wherein the first track having a stop surface to thereby allow tilting open of the ice bin until the first pin engages the stop surface;

wherein the first pivot pin engages a curvilinear wall of the first track to form a first moving pivot point for the ice bin; and

wherein the second pivot pin engages a curvilinear wall of the second track to form a second moving pivot point for the ice bin; and

an insulated ice bin door forming a front surface of the ice bin.

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